APPLICATION GUIDE FOR A TRAFFIC STUDY OF A STEP-BY-STEP TELEPHONE CENTRAL OFFICE

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1. GENERAL

1.1 This section provides REA borrowers, consulting engineers, contractors, and other interested parties with technical information for use in making a traffic study of a telephone central office. It discusses in particular the setting-up of equipment, recording, and analysis of traffic usage data and replaces Section 516, Issue 1, January 1967.

1.2 The major reason for this reissue is to change the basis for determining the busy hour traffic. This determination is now being made on a peak traffic basis and the busy hour is therefore a random one. The grade of service for EAS trunks has also been changed.

1.3 This section is intended to combine the information given in other sections of the manual into a step-by-step procedure.

1.4 It is assumed that the reader has familiarized himself with other sections on traffic in this manual and with the more important features of dial switchboards.

2. INDICATION OF WHEN A TRAFFIC STUDY SHOULD BE MADE

2.1 The detection of overload conditions in the central office and consequently the need for additional equipment may be determined by reference to the traffic registers (PC, OF, ATB, and LTB) which are supplied with each central office. It is important that these registers be

kept in proper working condition and their operation should be checked at regular intervals. Periodic recordings of these meter registrations, made at intervals of no longer than one week, are essential.

2.2 The meter recordings are compared and observed for increase. The usefulness of these meter readings is found in their relative change from one period to another. The trend is indicative of the approach of overloading in the trunk group as the normal addition of new subscribers i made.

2.3 A word of caution in the All Trunks Busy (ATB), Overflow (OF), and Last Trunks Busy (LTB) readings should be given since registrations on these meters do not necessarily indicate the equipment is overloaded. It has been found in traffic studies that when a trunk group reaches about 60 percent of its REA recommended traffic handling capacity, these meters begin to show one or more registrations per day. Do not be concerned unti an average of 2 or more per group per day is maintained over a period of several months for ATB meters. An OF meter which registers an average of three counts or more per group per day over a period of several months indicates an approaching overload. If there are no indications on the ATI OF, or LTB registers and the registers are working properly, there is pro- bably too much equipment supplied and efficient use is not being made of

2.4 A regular review of peg count, linefinder ATB, and connector over- flow (OF) registers will show the balance of the traffic between intraoffice trunk groups of similar level. It happens many times, that in the normal process of adding subscribers and not knowing their calling habits, a disproportionate number of high usage lines will appear in one group. Balance can be reestablished to a large degree by comparison of register readings.

2.5 Once the need for a traffic usage study has been established, it should be made during the busy season just before ordering the addi tional equipment. If this is not possible, then the traffic measured may be corrected for the busy season. Unusual events, such as a blizzard or flood, should probably not be considered as a busy season for the purpose of traffic studies. These are just short periods of abnormally high traf and, if equipment is provided for this amount of traffic, it will be idle most of the time. However, if these occurrences are common and the econo of providing this additional equipment are favorable, adding additional e ment will improve service at these times. The pattern of the traffic sho determine the busy season length. It may be as short as a few weeks in f ing communities and as long as a few months in resort areas.

3. EQUIPMENT FOR USAGE STUDY

3.1 The most widely used method for making a traffic study is by means automatic trunk usage equipment. Other methods are available and described in REA TE & CM 515, "Telephone Traffic - Measurements."

Automatic equipment, however, is the most accurate and the easiest to use. This section will cover only a traffic usage study using this type of equipment.

3.2 There are a number of manufacturers of usage measuring equipment. The prices of this equipment vary widely. There are REA borrowers, consulting engineers, and other firms who have usage meters for rent.

3.3 Trunk usage meters come in a variety of forms, but all connect to the sleeve lead of each trunk in a group. The usage meter scans all connections to the sleeves during each cycle. Most meters have a switch to set the scan cycle desired. The most common settings are 10 seconds, 60 seconds, and 100 seconds. For convenience, 100-second scan cycles can be used for direct readings in unit calls, and 60-second scan cycles can be used for readings in minutes for use in separations studies.

3.4 The most convenient traffic measuring equipments have automatic printing heads which print the register readings at predetermined intervals. The most useful time interval is one hour. Periods of a half hour may be used, but anything less than that makes the analysis of data extremely time consuming and does not materially add to the information obtained.

3.5 If measuring equipment with counting registers is used, all registers must be read at least once an hour and coincident with the clock hour. Shorter intervals may be used as with printing meters. The scan cycle is counted on a separate cycle meter. The registers may be either read and recorded manually or photographed by an automatic camera.

4. PREPARATION FOR STUDY

4.1 The time for a usage meter study should be planned well in advance. A minimum of five business days is required. No Saturday or Sunday traffic is to be averaged as the normally light traffic on these days will be misleading. Plans must be made for at least one person to be in charge of the study and to be available throughout the study.

4.2 It is most important that the office be properly prepared for the study. All circuit troubles are to be cleared and no equipment made busy while the study is in process. Groups of equipment (either intraoffice or interoffice) with units not in operation may block normal flow of traffic in that group or in subsequent stages of switching. If for some reason, after the study has started, it becomes absolutely necessary to turn a traffic carrying unit out-of-service for more than a few minutes, the connection to this unit from the usage meter must be removed and the action noted on the data sheet.

4.3 Prior to setting up the traffic meter, the equipment on which measurements are to be made must be analyzed. The following information must be known before the meter is connected and during the subsequent traffic analysis:

4.31 The number of trunk groups to be measured.

4.32 The number of working trunks in each group. List separately those equipped, but not in use.

4.33 Trunking diagram of the office.

4.34 Grading scheme for all groups.

4.35 The records of ATB, OF, and PC, etc., readings made prior to the study.

4.36 Number of subscriber lines working, equipped, and wired for each linefinder group.

4.37 For terminal-per-station equipment, the number of connector terminals in use in each connector group.

5. SETTING UP RECORDER

5.1 When setting up the trunk usage meter it is first necessary that a location in the central office be found which will be away from the passage to the MDF and other places frequented by the routine maintenance people. This location must have 120 volts ac, and fused central office battery within reach of the cables supplied with the meter. The connecting points of all groups with traffic under study must be within reach of the scan cables supplied with the trunk usage equipment.

5.2 It is best to select a point where the sleeve leads of a group to be measured are physically grouped together. This makes connection of the clip leads on the cable associated with each meter far easier. A terminal strip, grading panel or cross connect point are examples of these places. Attempting to connect to each individual circuit plate will result in too much spread for the clip leads. Be certain always to connect to the sleeve lead. DO NOT CONNECT TO TIP, RING, OR LEADS OTHER THAN THE SLEEVE, unless they are leads specifically provided for usage study as in some manufacturers' equipment.

5.3 When reading the traffic in the linefinders, the connection of the [illegible] are made to the sleeve of the first selectors [illegible]lectors are equipped. A linefinder and a [illegible]onnected. Therefore, the first selectors [illegible] traffic. Use one register per group of

5.4 Traffic in the connector groups is measured from the connector sleeve. Use one register per connector group.

5.5 Traffic in the interoffice trunks is measured at the sleeve connected to the local first, second, or third selector level access point for the trunks involved. This point gives two-way traffic on the trunks (if they are two-way). To separate the incoming traffic from the outgoing traffic a separate register may be connected to the sleeves of the associated incoming trunk selectors. This will record only inward traffic, thus giving the desired separation between inward and outward traffic.

5.6 One register on the trunk usage meter must be assigned to each group of selectors, connectors, trunks, etc. Each register has its own group of scan points in an individual cable. A scan point must be connected to the sleeve of each path in the group being measured by the register. Any scan point leads not used are to be separated from ground and each other. This practice is to be followed for each register and each group. A careful record of the register number and corresponding equipment group with its number of equipped paths must be kept.

5.7 The operation of the traffic meter should be thoroughly tested. For print-out type meters each printing head being used must be checked to see if it registers and prints properly. The resetting mechanism must be in proper working order with all wheels returning to zero. Be certain that the time printed by the 24-hour clock starts at 0001, one minute after midnight, and ends with 2400, the next midnight. After 12:00 noon add 12 to the twelve-hour clock time to obtain the 24-hour clock time (4:00 pm is 1600). For counting type meters each register should be checked for proper operation. The cycle register which counts the number of cycles must be in proper working order also.

5.8 After all apparatus has been connected and thoroughly tested, the equipment is ready for operation. AT THIS POINT REMOVE FROM SERVICE ANY PARTS OF THE SWITCHING EQUIPMENT WHICH PLACE FALSE GROUNDS ON TRUNK SLEEVES TO GIVE ARTIFICIAL ROTATION OF THE EQUIPMENT. DEACTIVATE ALL TRUNK ALTERNATOR CIRCUITS in the equipment, i.e., equipment which makes a connector, selector, EAS or toll trunk artifically busy after it has been seized so that three successive calls will use different trunks. THIS IS NOT SIMPLY A MATTER OF PULLING FUSES, BUT OF INSULATING RELAY CONTACTS. BE CERTAIN THAT THE ONLY GROUNDS THAT APPEAR ON THE SLEEVES ARE SUPPLIED BY ACTUAL TRAFFIC IN THE SWITCHING SYSTEM.

6. RECORDING

6.1 Enough paper should be driven out of the print-out registers to insure that the drive mechanisms are working properly. Mark the bottom of the paper with all pertinent information and a description of what each printing head is scanning. BE CERTAIN TO WRITE DOWN THE SCAN CYCLE.

6.2 The equipment should run 24 hours a day to prevent starting problems on succeeding days. Readings during extremely light periods of traffic (early morning hours) will indicate any troubles that may have developed since the start of the study. Thirty-six unit calls, or multiples of thirty-six unit calls, per hour for successive hours indicates one or more permanently busy circuits which must be corrected and accounted for in the data.

6.3 With all methods of readout a periodic check of the operation must be made. The meter registrations must be compared at intervals with the actual number of circuits busy. If something happens that will affect the readings on any or all the registers anytime during the study, notes must be made on the data sheets. The notes must include the type of trouble, the time it started, and the time it was cleared.

7. ANALYSIS

7.01 After the data has been collected, it is necessary to tabulate it in a form that makes it easy to determine the busiest hour of each day for each group. It is not likely that all groups will have the same busy hour and we are concerned with the traffic capacity of each group.

7.02 The data sheets for each day are then marked to show the particular hour where the most registrations were recorded for each group. Example: Linefinder Group Number 1 may be busiest between 0900 and 1000, and Linefinder Group Number 2 may be busiest between 0800 and 0900. The most registrations per hour in any one group probably will not fall in the same hour each day.

7.03 Average the busiest hour of each day for the number of registrations in each trunk group. This means on a five-day study you will have to average five hours for each trunk group. This will give a random busy hour rather than the classic busy hour.

7.04 After the random busy hour average for a group has been determined, the average is converted to unit calls if the data was not taken directly in unit calls. The conversion is directly dependent on the number of seconds per scan cycle of the usage meter. This determines how many cycles there are per busy hour.

7.05 To convert to unit calls use the following equation:

$$\text{Registrations per random busy hour (average)} \times \frac{\text{Seconds per Scan Cycle}}{100} = \text{UC/Random Busy Hour}$$

7.06 Example 1 demonstrates the method of determining the random busy hour traffic using automatic printing registers. The information shown at the bottom of each data sheet must be shown for all groups. The busiest hour of each day for each group is circled. The work sheet shows the calculation of busy hour traffic.

7.07 Example 2 shows the same traffic study using manually recorded data. The calculations shown on the work sheet in Example 1 also hold for this example.

7.08 The number of unit calls can now be referred to the traffic table covering the type of trunk measured. (See Tables 1 through 4 in this section.) If there is a significant difference between the average per day peg count during the study and the average per day peg count during the busy season, the unit calls should be increased by the ratio of the busy season peg count divided by the study period peg count. This corrected amount should then be referred to the proper table.

7.09 When using the trunk tables there is a spread. When the number of unit calls measured goes above the high figure in the number of trunks equipped, trunks should be added until the measured unit calls match or are less than the low figure for the new total of trunks.

7.10 In the event the number of unit calls measured is two or more times those recommended in the table for the number of trunks equipped, the data is likely to be unreliable for the number of trunks required. The blocking of calls when this happens tends to cause people to spread their calling over the day with no one hour distinctly busier than another. When the flow of traffic is opened, an hour with many more unit calls than any other will develop and this will require more trunks than planned. On such a group another study should be made about six months after the addition of trunks. For a situation such as this it is best to increase the addition by at least one trunk more than required by the tables.

7.11 A useful comparison for cases where no additional equipment will be required is a percentage of measured traffic to rated traffic. If this percentage is below 80 percent, it is possible that equipment may be moved from one group to another in order to balance traffic or to help a group that is overloaded.

7.12 After the requirements for additional equipment have been determined from the traffic study, it is appropriate to consider buying additional equipment for a predicted future traffic. The problems of obtaining additions include possible delays due to manufacturer's production schedules and make it advisable to buy equipment to provide adequate service for at least three years. The time varies with how fast the area being served is growing and the amount of equipment being installed.

7.13 The recommended approach, unless some other method better fits a specific system, is to determine the present per station traffic in each trunk group. Take care to determine how many stations have access to each of the different interoffice and intraoffice trunk groups.

7.14 After a ratio between unit calls and number of subscribers had been determined, the traffic to be expected in three years in any trunk group is predicted by the number of subscribers who will be using the group at the future time. The formula is as follows:

$$\frac{\text{Total Measured Random BH Unit Calls in Group}}{\text{Number of Stations Accessing Group}} \times \text{Number of Stations Accessing Group in Three Years} = \text{UC}$$

Apply the UC thus obtained to the proper traffic table.

7.15 Average holding times may be developed from peg counts taken at the time of the study. Holding times are not useful in directly determining the amount of equipment required, but provide useful information for future reference. The holding time in seconds can be used for a rough determination of traffic in a group by multiplying it by the peg count for that group and dividing by 100 to get unit calls. If such an addition is contemplated, it can be used in the future for calculations required in determining common control quantities. The value of the holding time is a check as to the accuracy of the traffic data. The expected holding time for connectors is between 100 and 250 seconds. If it measures much above or below that, the data should be checked.

7.16 The peg counts for a group are to be averaged for the random busy hour of that group. The following formula is then used:

$$\frac{\text{UC Random Busy Hour Average} \times 100}{\text{Peg Count Random Busy Hour Average}} = \text{Holding Time in Seconds}$$

7.17 The ATB, LTB, PC, and OF meters should each be averaged per day (including Saturday and Sunday) during the study for seven days, five of which are the days the usage measurement is taken. Compare this information with that acquired by the usage study in order to obtain a point of reference for the future use of ATB, LTB, PC, and OF meters. When equipment is added, a comparison will demonstrate the results. If no equipment is needed, comparisons will show the increase toward full load as the traffic increases due to new connects. If a case of traffic unbalance is found in the board, the meters will indicate the effect of future attempts to balance traffic.

7.18 A properly conducted traffic study is the most useful method available to determine the equipment quantities necessary and the most economical amounts of equipment to buy. The method of buying haphazard quantities is not valid under any condition and cannot be condoned in a properly administered system.

Example 1

Traffic Study Print-out

Iowa 895
Any Town Exchange

0600	00011	00016	00009
0500	00016	00003	00016
0400	00002	00000	00029
0300	00011	00012	00017
0200	00000	00007	00027
0100	00021	00041	00056
2400	00046	00067	00071
2300	00098	00025	00103
2200	00121	00112	00125
2100	00147	00096	00176
2000	00182	00164	00212
1900	00206	00207	00308
1800	00326	00296	00442
1700	00378	00465	00461
1600	00433	00235	00522
1500	00348	00141	00429
1400	00060	00100	00127
1300	00170	00256	00221
1200	00221	00236	00338
1100	00449	00326	00562
1000	00552	00514	00628
0900	00572	00497	00712
0800	00313	00454	00428
0700	00126	00176	00143
	Linefinder 2300	Linefinder 2600	Linefinder 2900
5/17/71	7 Equipped	7 Equipped	7 Equipped
	Scan Cycle 10 Seconds	Scan Cycle 10 Seconds	Scan Cycle 10 Seconds

EXAMPLE 1

Traffic Study Print-Out

Iowa 895
Any Town Exchange

0600	00041	00021	00027
0500	00002	00006	00009
0400	00000	00009	00017
0300	00006	00021	00029
0200	00009	00021	00043
0100	00052	00047	00071
2400	00074	00062	00086
2300	00102	00091	00102
2200	00124	00119	00172
2100	00162	00143	00202
2000	00217	00192	00281
1900	00279	00223	00327
1800	00308	00214	00422
1700	00319	00214	00472
1600	00349	00195	00486
1500	00353	00056	00421
1400	00373	00197	00462
1300	00328	00336	00427
1200	00630	00486	00840
1100	00784	00193	00943
1000	00671	00660	00926
0900	00786	00615	01026
0800	00159	00333	00341
0700	00092	00107	00123
	Linefinder 2300	Linefinder 2600	Linefinder 2900
5/19/71	7 Equipped	7 Equipped	7 Equipped
	Scan Cycle 10 Seconds	Scan Cycle 10 Seconds	Scan Cycle 10 Seconds

Example 1

Traffic Study Print-out

Iowa 895
Any Town Exchange

	Linefinder 2300 7 Equipped Scan Cycle 10 Seconds	Linefinder 2600 7 Equipped Scan Cycle 10 Seconds	Linefinder 2900 7 Equipped Scan Cycle 10 Seconds
0600	00043	00017	00082
0500	00012	00003	00011
0400	00000	00011	00006
0300	00000	00007	00020
0200	00009	00016	00027
0100	00017	00022	00047
2400	00041	00028	00053
2300	00062	00051	00086
2200	00102	00076	00161
2100	00152	00108	00217
2000	00216	00095	00328
1900	00317	00077	00581
1800	00228	00232	00429
1700	00378	00284	00614
1600	00218	00122	00413
1500	00384	00343	00526
1400	00263	00226	00482
1300	00236	00439	00424
1200	00117	00600	00281
1100	00938	00294	01016
1000	00571	00957	01121
0900	00721	00995	00861
0800	00351	00355	00426
0700	00181	00121	00176

5/18/71

EXAMPLE 1

Traffic Study Print-out

Iowa 895
Any Town Exchange

0600	00029	00009	00028
0500	00006	00012	00009
0400	00012	00020	00012
0300	00017	00031	00020
0200	00036	00042	00041
0100	00046	00076	00091
2400	00092	00102	00112
2300	00152	00129	00162
2200	00221	00172	00224
2100	00272	00203	00282
2000	00364	00221	00372
1900	00454	00322	00421
1800	00731	00467	00782
1700	00318	00478	00462
1600	00307	00530	00446
1500	00219	00368	00321
1400	00407	00197	00546
1300	00350	00278	00423
1200	00183	00490	00127
1100	00465	00449	00251
1000	00654	00975	00426
0900	01335	00594	01522
0800	00272	00244	00427
0700	00123	00102	00162
	Linefinder 2300	Linefinder 2600	Linefinder 2900
5/20/71	7 Equipped	7 Equipped	7 Equipped
	Scan Cycle 10 Seconds	Scan Cycle 10 Seconds	Scan Cycle 10 Seconds

EXAMPLE 1

Traffic Study Print-out

Iowa 895
Any Town Exchange

0600	00041	00029	00036
0500	00011	00000	00000
0400	00000	00007	00003
0300	00002	00020	00017
0200	00009	00036	00021
0100	00024	00071	00042
2400	00082	00083	00061
2300	00128	00101	00097
2200	00169	00121	00172
2100	00201	00142	00217
2000	00242	00171	00329
1900	00312	00192	00418
1800	00490	00610	00621
1700	00665	00292	00841
1600	00258	00114	00586
1500	00231	00045	00511
1400	00304	00062	00622
1300	00154	00202	00416
1200	00393	00196	00622
1100	00300	00441	00542
1000	00405	00675	00622
0900	00888	00640	01044
0800	00325	00259	00541
0700	00172	00184	00207
	Linefinder 2300	Linefinder 2600	Linefinder 2900
5/21/71	7 Equipped	7 Equipped	7 Equipped
	Scan Cycle 10 Seconds	Scan Cycle 10 Seconds	Scan Cycle 10 Seconds

EXAMPLE 1

WORK SHEET

PROJECT NUMBER IOWA 895

DATE 5/26/71

EXCHANGE Any Town

Type of Equipment	Linefinder 2300 Group	Linefinder 2600 Group	Linefinder 2900 Group
Number of Circuits Equipped	7	7	7
5/17/71	572	514	712
5/18/71	938	995	1121
5/19/71	786	660	1026
5/20/71	1335	975	1522
5/21/71	888	675	1044
TOTAL	4519	3819	5425
AVERAGE	904	764	1085
UNIT CALLS AVERAGE	904/10 = 90.4 UC	764/10 = 76.4 UC	1085/10 = 108.5 UC
CAPACITY	98.0 UC	98.0 UC	98.0 UC
ADDITIONAL EQUIPMENT NEEDED	None	None	One

EXAMPLE 2

TRAFFIC REGISTER READINGS

PROJECT IOWA 995			CENTRAL OFFICE ANY TOWN, IOWA								
TYPE OF PROJECT			LINE FINDER 2300	LINE FINDER 2300	LINE FINDER 2300						
DATE May 17, 1971		CYCLE	1	2	3	4	5	6	7	8	9
TIME	NO. CTS. EQUIP.		7	7	7						
0700	READING	9026	8689	3170	4124						
	DIFF.	360	313	454	428						
0800	READING	9386	9002	3624	4552						
	DIFF.	360	572	497	712						
0900	READING	9746	9574	4121	5264						
	DIFF.	360	552	514	628						
1000	READING	0106	0126	4635	5892						
	DIFF.	360	449	326	562						
1100	READING	0466	0575	4961	6454						
	DIFF.	360	221	236	338						
1200	READING	0826	0796	5197	6792						
	DIFF.	360	170	256	221						
1300	READING	1186	0966	5453	7013						
	DIFF.	360	60	100	127						
1400	READING	1546	1026	5553	7140						
	DIFF.	360	348	141	429						
1500	READING	1908	1374	5694	7569						
	DIFF.	360	433	235	522						
1600	READING	2268	1807	5929	8091						
	DIFF.	360	378	465	461						
1700	READING	2628	2185	6394	8552						
	DIFF.	360	326	296	442						
1800	READING	2988	2311	6690	8994						
	DIFF.	360	206	207	308						
1900	READING	3346	2517	6897	9302						
	DIFF.										

EXAMPLE 2

TRAFFIC REGISTER READINGS

PROJECT IOWA 395					CENTRAL OFFICE ANY TOWN, IOWA						
TYPE OF PROJECT			LINE FINDER 2300	LINE FINDER 2300	LINE FINDER 2900						
DATE May 18, 191		CYCLE	1	2	3						
TIME	NO. CTS. EQUIP.		7	7	7						
0700	READING	4606	3299	7299	5218						
	DIFF.	360	351	355	426						
0800	READING	4966	3650	7654	5644						
	DIFF.	360	721	995	861						
0900	READING	5326	4371	8649	6505						
	DIFF.	360	571	957	1121						
1000	READING	5686	4942	9606	7626						
	DIFF.	360	938	294	1016						
1100	READING	6046	5880	9900	8642						
	DIFF.	360	117	600	281						
1200	READING	6406	5997	0500	8923						
	DIFF.	360	236	439	424						
1300	READING	6766	6233	0939	9347						
	DIFF.	360	263	226	482						
1400	READING	7126	6496	1165	9829						
	DIFF.	360	384	343	526						
1500	READING	7486	6880	1508	0355						
	DIFF.	360	218	122	413						
1600	READING	7846	7098	1630	0768						
	DIFF.	360	378	284	614						
1700	READING	8205	7476	1914	1382						
	DIFF.	360	228	232	429						
1800	READING	8566	7704	2146	1811						
	DIFF.	360	317	77	581						
1900	READING	8926	8021	2223	2392						
	DIFF.										

TRAFFIC REGISTER READINGS

PROJECT IOWA 895 — CENTRAL OFFICE ANY TOWN, IOWA

TYPE OF PROJECT			LINE FINDER 2300	LINE FINDER 2600	LINE FINDER 2900						
DATE May 19 1971		CYCLE	1	2	3						
TIME	NO. CTS. EQUIP.		7	7	7						
0700	READING	0068	8779	2788	3622						
	DIFF.	360	159	333	341						
0800	READING	0428	8938	3121	3963						
	DIFF.	360	(786)	615	(1026)						
0900	READING	0788	9724	3736	4989						
	DIFF.	360	671	(660)	926						
1000	READING	1148	0395	4396	5915						
	DIFF.	360	784	193	943						
1100	READING	1508	1179	4589	6858						
	DIFF.	360	630	486	840						
1200	READING	1868	1809	5075	7698						
	DIFF.	360	328	336	427						
1300	READING	2228	2137	5411	8125						
	DIFF.	360	373	197	462						
1400	READING	2588	2510	5608	8587						
	DIFF.	360	353	56	421						
1500	READING	2948	2863	5664	9008						
	DIFF.	360	349	195	486						
1600	READING	3308	3212	5859	9494						
	DIFF.	360	319	214	472						
1700	READING	3668	3531	6073	9966						
	DIFF.	360	308	214	422						
1800	READING	4028	3839	6287	0388						
	DIFF.	360	279	223	327						
1900	READING	4388	4118	6510	0715						
	DIFF.										

EXAMPLE 2

TRAFFIC REGISTER READINGS

PROJECT IOWA 895					CENTRAL OFFICE ANY TOWN, IOWA						
TYPE OF PROJECT			LINE FINDER 2300	LINE FINDER 2300	LINE FINDER 2900						
DATE May 20, 1971		CYCLE	1	2	3						
TIME	NO. CTS. EQUIP.		7	7	7						
0700	READING	5458	4736	7254	4290						
	DIFF.	360	272	244	427						
0800	READING	5818	5008	7498	4717						
	DIFF.	360	1335	594	1522						
0900	READING	6178	6343	8092	6239						
	DIFF.	360	654	975	426						
1000	READING	6538	6997	9067	6665						
	DIFF.	360	465	449	251						
1100	READING	6898	7462	9516	6916						
	DIFF.	360	183	490	127						
1200	READING	7258	7645	0006	7043						
	DIFF.	360	350	278	423						
1300	READING	7618	7995	0284	7466						
	DIFF.	360	407	197	546						
1400	READING	7978	8402	0481	8012						
	DIFF.	360	219	368	321						
1500	READING	8338	8621	0849	8333						
	DIFF.	360	307	530	446						
1600	READING	8698	8928	1379	8779						
	DIFF.	360	318	478	462						
1700	READING	9058	9246	1857	9241						
	DIFF.	360	731	467	782						
1800	READING	9418	9977	2324	0023						
	DIFF.	360	454	322	421						
1900	READING	9778	0431	2646	0444						
	DIFF.										

EXAMPLE 2

TRAFFIC REGISTER READINGS

PROJECT IOWA 555			CENTRAL OFFICE ANY TOWN, IOWA									
TYPE OF PROJECT			LINE FINDER 2300	LINE FINDER 2600	LINE FINDER 2900							
DATE May 21, 19??	CYCLE		1	2	3							
TIME	NO. CTS. EQUIP.		7	7	7							
0700	READING	0854	0884	3364	6211							
	DIFF.	360	325	259	541							
0800	READING	1214	1209	3623	6752							
	DIFF.	360	888	640	1044							
0900	READING	1574	2097	4263	7796							
	DIFF.	360	405	675	622							
1000	READING	1934	2502	4938	8418							
	DIFF.	360	300	441	542							
1100	READING	2294	2802	5379	8960							
	DIFF.	360	393	196	622							
1200	READING	2654	3195	5575	9582							
	DIFF.	360	154	202	416							
1300	READING	3014	3349	5777	9998							
	DIFF.	360	304	62	622							
1400	READING	3374	3653	5839	0620							
	DIFF.	360	231	45	511							
1500	READING	3734	3884	5884	1131							
	DIFF.	360	258	114	586							
1600	READING	4094	4142	5998	1717							
	DIFF.	360	665	292	841							
1700	READING	4454	4807	6290	2558							
	DIFF.	360	490	610	621							
1800	READING	4814	5294	6900	3179							
	DIFF.	360	312	192	418							
1900	READING	5174	5606	7092	3597							
	DIFF.											

TABLE 1

TRUNK CAPACITY TABLES FOR INTRAOFFICE TRUNKS
(10 Terminal Access)

Number Trunks Per Group	Unit Calls: Linefinders: Less Than 100 Percent Line Lockout	Unit Calls: Linefinders: 100 Percent Line Lockout	Unit Calls: Linefinder Connectors	Unit Calls: Connectors: From First Sels.	Unit Calls: Connectors: From Second Sels.	Unit Calls: Second Sels.	Number Trunks Per Group
3	16	20	20	24	16	20	3
4	30	37	37	42	30	37	4
5	46	55	55	62	46	56	5
6	64	77	77	83	64	76	6
7	84	98	98	105	84	97	7
8	105	122	122	129	105	119	8
9	126	144	144	153	126	142	9
10	149	168	168	178	149	166	10
11	172	192	192	199	168	194	11
12	195	218	218	220	187	216	12
13	220	242	242	242	205	236	13
14	244	270	270	262	223	257	14
15	269	296	296	284	241	278	15
16	294	324	324	305	259	299	16
17	320	352	352	327	276	319	17
18	346	380	380	347	294	341	18
19	373	408	408	367	312	363	19
20	399	436	436	387	329	385	20
21	426	462	462	406	347	408	21
22	453	494	494	425	364	429	22
23	480	520	520	444	382	451	23
24	507	550	550	463	399	473	24
25	535	580	580	483	417	495	25
26	562	610	610	503	435	516	26
27	590	640	640	523	453	537	27
28	618	670	670	542	470	558	28
29	647	700	700	562	488	579	29
30	675	730	730	582	506	600	30

Graded

TABLE 2

TRUNK CAPACITY TABLES FOR INTRAOFFICE TRUNKS
(15 Terminal Access)

Number Trunks Per Group	Unit Calls: Linefinders: Less Than 100 Percent Line Lockout	Unit Calls: Linefinders: 100 Percent Line Lockout	Unit Calls: Linefinder Connectors	Unit Calls: Connectors: From First Sels.	Unit Calls: Connectors: From Second Sels.	Unit Calls: Second Sels.	Number Trunks Per Group
3	16	20	20	24	16	20	3
4	30	37	37	42	30	37	4
5	46	55	55	62	46	56	5
6	64	77	77	83	64	76	6
7	84	98	98	105	84	97	7
8	105	122	122	129	105	119	8
9	126	144	144	153	126	142	9
10	149	168	168	178	149	166	10
11	172	192	192	204	172	198	11
12	195	218	218	230	195	226	12
13	220	242	242	256	220	253	13
14	244	270	270	283	244	281	14
15	269	296	296	310	269	310	15
16	294	324	324	335	290	335	16
17	320	352	352	360	312	361	17
18	246	380	380	385	334	386	18
19	373	408	408	408	355	411	19
20	399	436	436	430	376	436	20
21	426	462	462	453	397	461	21
22	453	494	494	476	417	485	22
23	480	520	520	498	437	511	23
24	507	550	550	521	457	536	24
25	535	580	580	544	477	563	25

Graded

TABLE 3

INTEROFFICE TRUNKS
UNIT CALLS
(10 Terminal Access)

No. of Trunks	EAS and Toll P = .01 to P = .03	DDD-CAMA (Rev. Call Switches) P = .01	No. of Trunks
2	5 - 10	5	2
3	16 - 24	16	3
4	30 - 42	30	4
5	46 - 62	46	5
6	64 - 83	64	6
7	84 - 105	84	7
8	105 - 129	105	8
9	126 - 153	126	9
10	149 - 178	149	10
11	175 - 208	175	11
12	194 - 230	194	12
13	214 - 252	214	13
14	233 - 274	233	14
15	252 - 296	252	15
16	271 - 318	271	16
17	291 - 340	291	17
18	310 - 362	310	18
19	331 - 385	331	19
20	351 - 408	351	20

TABLE 4

INTEROFFICE TRUNKS
UNIT CALLS
(15 Terminal Access)

No. of Trunks	EAS and Toll P = .01 to P = .03	DDD CAMA P - .01	No. of Trunks
2	5 - 10	5	2
3	16 - 24	16	3
4	30 - 42	30	4
5	46 - 62	46	5
6	64 - 83	64	6
7	84 - 105	84	7
8	105 - 129	105	8
9	126 - 153	126	9
10	149 - 178	149	10
11	172 - 204	172	11
12	195 - 230	195	12
13	220 - 256	220	13
14	244 - 283	244	14
15	269 - 310	269	15
16	310 - 352	310	16
17	334 - 379	334	17
18	357 - 404	357	18
19	382 - 431	382	19
20	405 - 456	405	20